~~UNCLASSIFIED~~ ~~CONFIDENTIAL~~ ~~SECRET~~

ROUTING AND RECORD SHEET

INSTRUCTIONS: Officer designations should be used in the "TO" column. Under each comment a line should be drawn across sheet and each comment numbered to correspond with the number in the "TO" column. Each officer should initial (check mark insufficient) before further routing. This Routing and Record Sheet should be returned to Registry.

FROM: OC-OIT					TELEPHONE NO.	
					DATE	

TO	ROOM NO.	DATE REC'D	DATE FWD'D	OFFICER'S INITIALS	TELEPHONE	COMMENTS
1. OC-E		MAY 2 1956	5/2	[illegible]		
2. OC-S			5/2	[illegible]		
3. P+D			5/4	[illegible]		
4. R&D/MS			5/4	MS		3-4 Pse remove 1 copy & place in Lab. report files if any RS-13 data we have. [illegible]
5. R&D/EP			5/4	[illegible]		
6. FCS			5/8	FCS		
7. PEB/RSS			5.20 [illegible]			
8. R&D/Lab		5/28	OK	CK.		
9.						
10. R&D/EP						file 2099
11.						
13.						
14.						
15.						

FORM NO. 1 APR 55 610 REPLACES FORM 51-10 WHICH MAY BE USED.

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CONFIDENTIAL

Chief, SB 30 April 1956

Chief, SB/CT

RS-13 Tests

1. The attachments describe the RS-13 tests conducted during the period 10 - 13 April 1956 and the results obtained.

2. As indicated in the attachments, excellent results were obtained. However, it would be advisable to conduct additional tests of this equipment before arriving at the conclusion that results such as these can be consistently obtained with this equipment.

[redacted] 50X1

ORIG: [redacted] 50X1

cc: ~~OC-E~~ - 2 w/3 atts.

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FIELD TEST OF MODIFIED RS-13 EQUIPMENT

A. GENERAL

1. During the period 10 to 13 April, inclusive, RS-13 tests were conducted between [redacted] and a field location at Ft. Pierce, Florida. 50X1
Participating personnel included the following:

[redacted] 50X1

[redacted] accompanied the Commo field team to provide for cover 50X1
at the [redacted] 50X1

2. The primary purpose of the test was to evaluate two RS-13 transmitters which had been modified to eliminate previous difficulties encountered with this equipment. In this connection, it is interesting to compare the results of this test with those conducted from this same location in January 1956. During the January tests, 15 attempts were made to contact [redacted] with contact being established on four schedules. On 50X1
this recent test, 21 attempts were made to establish contact between [redacted] and Ft. Pierce, all of which were successful. Propagation conditions during the first test, however, were not as favorable as during the recent test, averaging 6 on the NBS Q-scale throughout the days of the first test. 50X1

3. Propagation conditions for the North Atlantic Area as reported by the National Bureau of Standards were 7 on all test days (as expressed on the NBS Q-scale, where 9 is excellent, 8 very good, 7 good, 6 fair-to-good, 5 fair, etc.). The [redacted] - Ft. Pierce path distance is 825 miles. 50X1

4. The following equipment was tested:

a. RS-13 equipment with the transmitter modified by the OC-E Laboratory to provide off-on keying, single antenna operation, and a antenna modified tuning network. The antenna tuning modification consisted of providing the transmitter with a tapped coil tuning system similar to that employed in the RT-6. In the following paragraphs and in the attachments this transmitter is referred to as "Lab-13".

b. RS-13 equipment with the transmitter modified by a contractor to provide for off-on keying, single antenna operation, and a full pi antenna tuning network. In the following paragraphs and in the attachments this transmitter if referred to as [redacted]13". 50X1

c. AR-2 Hellschreiber printer. An RR-6A receiver was used in conjunction with this printer.

d. RBR-13 modified by the OC-E Laboratory to provide simplified tuning and increased sensitivity.

5. In order to provide a basis for comparison, manual CW contacts using an RS-6A preceded approximately every other RS-13 test schedule.

6. [redacted] was used for all RS-13 contacts on which base used CW to answer field. Modified [redacted] was used for all RS-13 contacts on which base answered field using Hellschreiber. 50X1 50X1

B. FIELD EQUIPMENT

1. The two RS-13 versions were used alternately for the RS-13 contacts, with the LAB-13 being used on approximately one-half of the contacts and the PRC-13 for the remainder. The same power supply, tape puller, battery and receiver were used on all RS-13 tests.

2. The AR-2 was used by the field on approximately one-half of the RS-13 contacts. In addition, three special transmissions were made by base for AR-2 test. When the AR-2 was used with the RS-13, a single antenna was used for receive/transmit.

3. A 12 volt lead acid automobile battery was used throughout all RS-13 tests. The battery powered all RS-13 equipment except the receiver. The receiver was operated from the RS-6 AC power supply in order to reduce battery drain. The battery was charged only when the automobile was in use, which was for approximately 50 miles of driving daily. In spite of the limited amount of charging, the battery remained in excellent condition throughout the tests.

4. Field antennas and equipment layout are illustrated in the attachment.

C. BASE EQUIPMENT

1. The modified RBR-13 was used throughout the tests.

2. Base equipment is illustrated in the attachment.

D. EQUIPMENT COMMENTS

1. LAB-13

a. Some difficulty was encountered in loading certain antenna lengths because of the unreliability of the mazda bulb tuning indicators. For example, with certain frequencies the plate current bulb would provide no indication of Ip dip with the function switch in the TUNE position, but it would provide an indication of tuning with the same frequency when the function switch was placed in the START position. In other cases the reverse was true; a good indication of final tuning would be obtained in the TUNE position, but none in the START position.

b. With this transmitter the final plate current is dipped and the tapped coil adjusted to the position which provides maximum output as indicated by a mazda bulb. However, considerable jockeying between these two controls is necessary to achieve optimum output. It is usually necessary to retune the final with the tapped coil in each of two or three positions to determine the plate tuning/antenna tuning combination which will produce the best power output.

c. No transmitter equipment failures were encountered. However, the battery charger in the RS-13 set was found to be defective because of failure of the selenium rectifier cells.

2. PRC-13

a. No difficulty was encountered in loading any of the antennas used during these tests. However, 17 turns of the pi network inductance tuning control are required to travel the coil length, and this frequently makes tuning somewhat lengthy, particularly when the tuning point is missed on the first pass. This can easily occur with certain antenna lengths. A control which would permit traveling the entire length of the coil in not more than three full turns would greatly simplify tuning.

b. This transmitter uses two meters to measure final Ip and antenna RF voltage. The Ip meter can be eliminated without introducing any tuning difficulties, and the RF voltmeter used for both final and antenna tuning. This meter provides an excellent indication of optimum tuning.

c. No equipment failures were encountered with the [redacted]-13 transmitter. 50X1

3. AR-2

a. The helix set screws loosened and the printer was rendered inoperative. Repairs were made.

b. An intermittent open developed in the connecting cable between the receiver and the AR-2. The cable was repaired.

c. While copying a base broadcast, the Hellschreiber tape once backed into the tape slot binding the tape puller. A minor change can be made in the tape slot to make binding less likely.

d. The sensitivity control on the AR-2 printer appeared to have no effect on the printer.

e. It was determined that when the screws holding the printer in its case were loose the printer functioned normally, but when they were tightened the unit became inoperative.

f. Vibrator hash from the RS-13 power supply was evident in the receiver, particularly when the AR-2 was in use.

E. SUMMARY

1. RS-13 Equipment

a. Excellent results were obtained with both transmitters. On almost every schedule field was immediately heard by base, and in only a few instances was it necessary for base to change field's frequency or to request a rerun of traffic. In most of the cases where field frequency shifts or reruns show in the log they were made simply to test other frequencies or to test the operating procedure. Although no attempt was made to keep contacts short, it is believed that at least 90% of the contacts could have been terminated within two to three minutes, had this been desired. Even when poor antennas were used by field, results continued to be good. The results of these tests exceeded by a wide margin those anticipated.

b. Recommendations concerning the changes to be incorporated into the remaining RS-13 transmitters are being submitted separately.

2. AR-2 Equipment

a. Percent of readable copy obtained on the AR-2 varied between 20 and 100%. Low percentages of readable copy were found to present no difficulties during two-way contacts, primarily because of the procedure used. Using [redacted] modified for AR-2 reception, base used endless tapes to transmit all instructions to field. For example, when base was ready to receive field's traffic, a previously prepared QRV tape was placed in the Hellschreiber keyer and allowed to run until field acknowledged receipt by beginning his message transmission. 50X1

b. Although use of the AR-2 extends contact time over what could be obtained by using a trained W/T operator and CW from base to field, this additional time should not exceed thirty or forty seconds on an average contact.

c. One hundred percent copy was received on only a few contacts with the AR-2. Although base was using a 231-D transmitter and a class A rhombic (incorrect rhombic for this distance), it was evident that ample base power will be required for Hellschreiber traffic transmissions. Base was consistently 5 x 5 on CW.

d. The tests showed that the RS-13 transmitter with the AR-2 printer provides a workable automatic system for two-way communications.

3. Modified RBR-13

   a. The modified RBR-13 produced excellent results at the base station. The unit provides for a much easier and more accurate method for matching the RBR-13 input to the receiver IF output. The readability of almost all tapes after redubbing exceeded that obtained on any previous series of RS-13 contacts.

4. Procedure

   a. [redacted] the RS-13 operating procedure, was also tested during these schedules. With the possible exception of the length of field calls, no changes are required in this procedure. Should future tests produce results approaching those of this test, it is believed that the one minute field call could be reduced to thirty seconds. 50X1